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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR		ATTORNEY DOCKET NO.
09/093,291	06/08/98	VAN BUSKIRK	P	ATMI-272

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EXAMINER	
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ART UNIT	**PAPER NUMBER**
1746	7

DATE MAILED: 08/28/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/093,291	Applicant(s) Van Buskirk et al.
	Examiner Allan Olsen	Group Art Unit 1746

☒ Responsive to communication(s) filed on *Jul 10, 2000*.

☒ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire *3* month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) *1-49 and 51-60* is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) *1-49 and 51-60* is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐approved ☐disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____.

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

DETAILED ACTION

Withdrawal of Claim Rejections

1. In view of the amendment filed 7/10/2000, the rejections of claims 1, 7, 23, 24, 47, 49 and 54, under 35 U.S.C. 112, second paragraph, are hereby withdrawn.

2. In view of the amendment and remarks filed 7/10/2000, the rejection of claims 1-4, 6, 8, 12-15, 28, 30, 31, 33 and 54 under 35 U.S.C. 102(e) as being anticipated by Smith et al. is hereby withdrawn.

3. In view of the amendment and remarks filed 7/10/2000, the rejection of claims 7 and 9-11 under 35 U.S.C. 103(a) as being unpatentable over Smith et al. is hereby withdrawn.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 58 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the

claimed invention. The added material which is not supported by the original disclosure is that of step (b) - "lacking a nitrogen- or phosphorous-containing π-acceptor ligand."

The express exclusion of certain elements implies the permissible inclusion of all other elements not so expressly excluded. This clearly illustrates that such negative limitation s do, in fact, introduce new concepts. *Ex Parte Grasselli,* 231 USPQ 393.

6. Claims 23 and 27 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 23 and 27 pertain to contacting an Ir residue with an agent to assist in volatilizing and removing the residue. The specification teaches the use of agents such as CO, PF_3 or $P(alkyl)_3$ (i.e. classic Lewis base and π-backbonding ligands). Specifically, on page 11, there is a teaching that CO may be used to assist in the volatilization of $Ir(X)_{1-6}$ by forming Ir carbonyl compounds, $Ir(CO)_y(X)_{1-6}$. In this teaching the $Ir(X)_{1-6}$ is the product a reaction between an Ir residue and a reactive halide composition. The $Ir(X)_{1-6}$ is not an agent used for contacting the Ir to assist in volatilizing the residue.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371© of this title before the invention thereof by the applicant for patent.

8. Claims 1, 3-6, 8, 9, 13-18, 28-33, 54, 57, 59 and 60 are rejected under 35 U.S.C. 102(e) as being anticipated by US 5,814,238 issued to Ashby et al. (hereinafter, Ashby).

☞ Claims 1, 3, 6, 15-18, 54, 57, 59 and 60: Ashby teaches a method for removing contaminants of Pt, Pd, Ir and Rh from the surface of a wafer that uses a gas phase reactive halide composition. Ashby teaches the use of SF_6 as a component of the reactive halide composition. See: col. 1, lines 10-16 and col. 4, lines 4,5 and 62.

☞ Claims 4, 13, 14, 30-32: SiF_x species, including radicals, are inherently present in the method of Ashby, as are the hexafluorides of the noble metal. Ashby teaches the removal of metal/metal silicides in a fluorine plasma environment which would inherently produce these claimed species (col. 7, line 45-67).

☞ Claim 5: Ashby teaches operating at a temperature of up to about 200°C (col. 7, line 18).

☞ Claims 8, 9: Ashby teaches a flow rate of 11 sccm and pressure of 125 mTorr (col. 8, lines 3,4).

☞ Claim 28, 29, 33: Ashby teaches the use of a cleaning enhancement agent/Lewis base (e.g. PF_3, CO, PR_3), an inert gas and a plasma (abstract; col. 3, line 26 - col. 5, line 8).

9. Claims 1-7, 10, 11, 13, 14, 17, 19-42, 44, 45 and 51-60 are rejected under 35 U.S.C. 102(e) as being anticipated by US 6,018,065 issued to Baum et al. (hereinafter, Baum).

The rejection over Baum may be overcome by Applicant's claim for priority to Baum. However, the executed declaration in this application makes no such claim for priority. Until such priority claim is perfected the rejection over Baum is maintained.

The Baum disclosure incorporates by reference the allowed US application 08/966,796. Therefore, the disclosure of the allowed application 08/966,796 is considered to contained within the Baum disclosure.

Baum teaches removing Iridium with a gaseous composition that includes XeF_2. Baum teaches the use of other reactive fluorine sources such as SF_6, SiF_4, Si_2F_6, SiF_2, SiF_3 in combination with XeF_2. Baum also teaches the use of CO as part agent to enhance volatility of the Ir. Baum teaches the use of reaction conditions such as pressure, temperature and time that coincide with the conditions of the instant claims. Baum's method is primarily directed to etching of Ir whereas the instant claims are directed to a method of "removing residue". The examiner noted that in the instant invention the residue is removed by etching. Furthermore, the method of Baum would inherently remove residue. For particularly relevant passages in '065 see col. 2, lines 52-65 and col. 4, line 59 - col.5, line 26. In 08/966,796 see: page 6, lines 4-15; page 7, lines 11-19; page 8- page 9; page 11, line 14- page 13, line 24; page 14, lines 4-26; page 15, lines 13-15.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 1, 7 and 34-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ashby ('238).

Ashby teaches a method of removing contamination from semiconductor wafers as described above. The method is very generic with regard to particular ways the method may be used. The reference broadly refers to electronic circuits, which generically embraces a capacitor

One skilled in the art would have been motivated to use Ashby's method to remove the impurities of the type described in claims 34-40 because, as pointed out by the applicant in pages 2-4 of the specification, it is well known that such impurities are present at the claimed stage of processing, and in the claimed form. Furthermore, it is well known and admitted that such impurities are very disadvantageous. Therefore, by applying Ashby's method for removing transition metal impurities from a wafer, one would eliminate or reduce problems, such as short circuiting, that are caused by such impurities.

The limitation of claim 7 pertains to the duration of the etching process. Process parameters such as time, flow rates, pressure, power or temperature are considered to be cause effective variables, the exact values of which may be optimized through routine experimentation, and as such are not patentable.

> "Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

In re Aller 105 USPQ 233, 255 (CCPA 1955).See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmscher* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sola* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934).

12. Claims 1, 8, 9, 41, 47 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baum.

As noted above this rejection may be overcome by perfecting the claim for priority.

Baum teaches the method of the instant claims as noted above.

Baum does not explicitly teach that gases including XeF_2, SiF_2 and SiF_3 are continually flowed through the reactor. However Baum does teach the use of a plasma in conjunction with the method. Its well known in the art that plasma apparatus are typically operated under a dynamic vacuum condition with a constant flow of gases entering (and leaving) the chamber.

It would have been obvious for one skilled, using a plasma to carry out the method of Baum, to operate under a pressure of 50 mTorr to about 2 Torr and to use a constant flow of XeF_2 of between 1 sccm and 10,000 sccm because these are standard condition that skilled artisans use for plasma methods.

13. Claims 1, 8, 12, 41, 43, 46-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baum in view of Chang et al. in Proc. of SPIE, vol. 2641, pp 117-128 (1995), hereinafter, Chang.

As noted above this rejection may be overcome upon perfecting the new claim for priority.

As noted above Baum does not teach that gases including XeF_2, SiF_2 and SiF_3 are continually flowed through the reactor. Also Baum does not teach the inclusion of silicon within the reaction chamber so that the XeF_2 can react with the silicon and form radicals of SiF_2 and SiF_3.

Chang teaches that the continuous flowing method is easier and more convenient. Therefore it would have been obvious for one skilled in the art to use this method.

Chang also teaches that XeF_2 reacts with silicon to form SiF_x species.

One skilled in the art would have been motivated to introduce silicon into the chamber because Chang teaches that this is a very convenient means of producing reactive species that Baum teaches are useful in the etching of Ir.

Response to Arguments

14. Applicant's arguments filed 7/10/2000 have been fully considered but they are not persuasive.

Applicants have taken the position that Ashby fails to teach the limitations of claim 1 because Ashby teaches removing noble metal residue with a nitrogen or phosphorous π-acceptor ligand and Ashby teaches using SF_6 in combination with a nitrogen or phosphorous π-acceptor ligand so that the SF_6 can react with the residue forming an intermediary reaction product which is subsequently volatilized upon the treatment with the nitrogen or phosphorous π-acceptor ligand. Applicants contend that Ashby's teaching of SF_6 fails to meet the limitation that a halide compound is present "in an amount effective to remove the residue".

The examiner believes Ashby clearly teaches the utility of SF_6 in the removal of Pt, Pd, Rh, or Ir residues. The examiner notes that the instant claims are drafted with "comprising" or open language. Therefore, the fact that SF_6 is not the only gas used by Ashby or that one may not view SF_6 to be the component of primary significance in Ashby's method does not diminish the fact that Ashby teaches a method, comprising the use of SF_6, to remove noble metal residue. Furthermore, the fact that the added SF_6 in Ashby's method reacts with the residue to form an intermediary reaction product does not detract from the fact that Ashby teaches a process of removing noble metal residues and the process uses SF_6. Even though Ashby does not specifically teach using SF_6 "an amount effective to remove ...." it would be obvious to a skilled artisan that Ashby's addition of SF_6 would not be made unless such an addition improved the removal of residue. Therefore, it would be obvious to one skilled in the art to add sufficient SF6 so that the expected improvement

in residue removal would be realized. The alternative of using an insufficient amount of SF_6 such that no improvement in the removal the residue is achieved would not be at all consistent with that which is the expected of a skilled artisan. The same reasoning applies to the limitation of claim 6, "for a time sufficient to effect removal."

Conclusion

15. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is (703) 306-9075. The examiner can normally be reached on Monday through Friday from 9:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached on (703) 308-4333. The fax phone number for this Group is (703) 305-5408.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.

Allan Olsen

August 18, 2000

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